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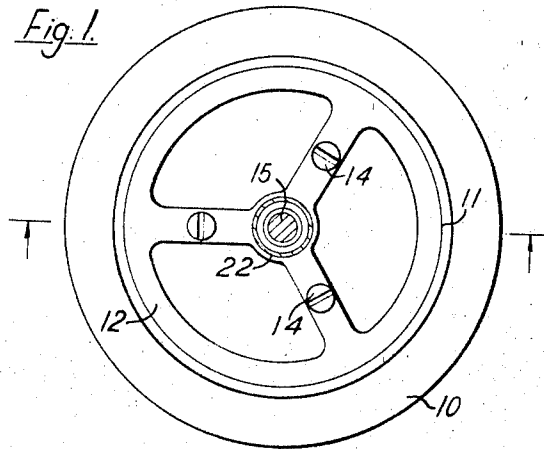
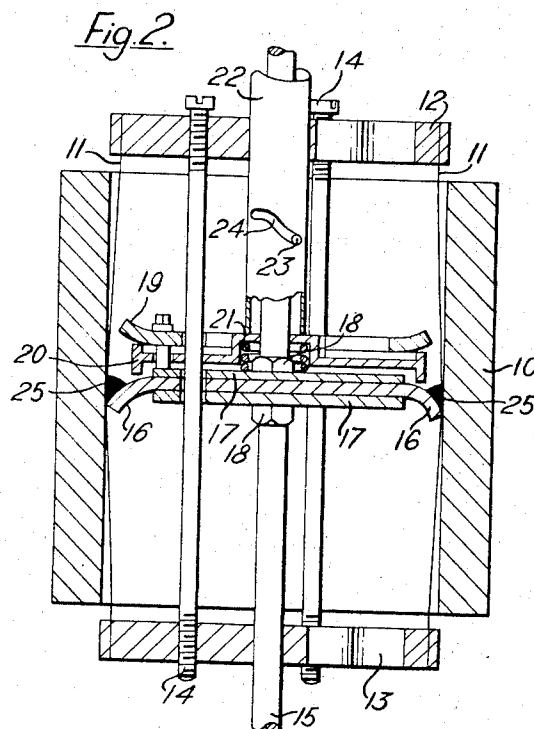
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SCREEN PRINTING APPARATUS

Filed April 11, 1967

2 Sheets-Sheet 1



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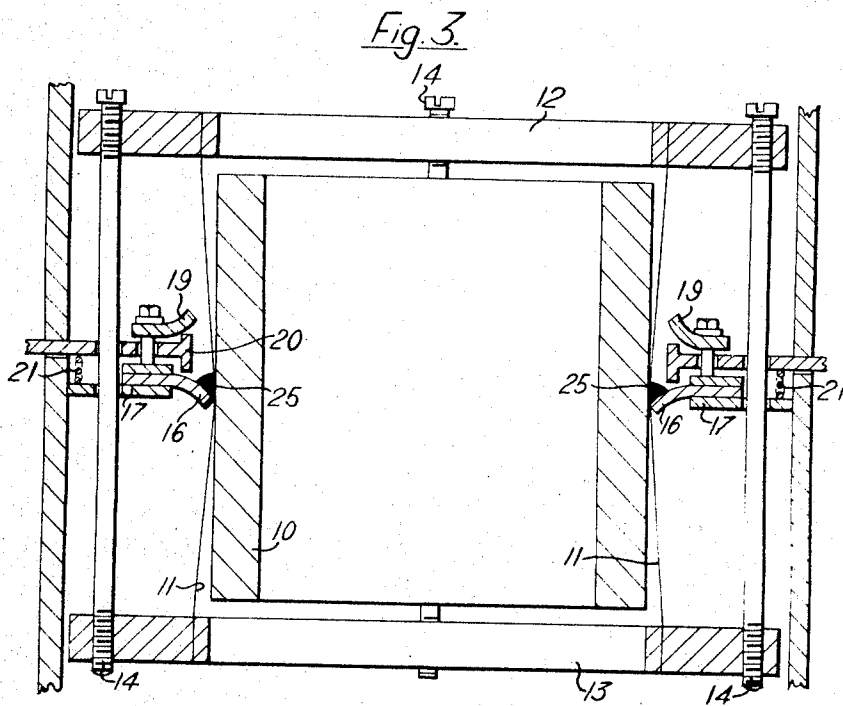
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2 Sheets-Sheet 2



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SCREEN PRINTING APPARATUS

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9 Claims. (Cl. 101—35)

ABSTRACT OF THE DISCLOSURE

Screen printing apparatus which may be used for printing on either external or internal cylindrical surfaces. The screen is stretched between supports which have the same shape as the surface, and a similarly-shaped squeegee is movable over the surface of the screen

This invention relates to screen printing apparatus.

Screen printing is used for printing on flat or cylindrical surfaces where the thickness of deposited ink is required to be greater than provided by other processes such as offset printing. The apparatus, in its simplest form, consists of a fine woven screen, usually of silk, and a squeegee for applying printing ink to the screen. The screen is rendered impervious to the printing ink by coating it with a suitable sealing material, and the matter to be printed is applied to the screen by removing this material from the appropriate parts of the screen. In use the screen is placed in close proximity to the surface to be printed, and the printing ink is applied to the screen by the squeegee. The ink passes through the screen, where the sealing material has been removed, on to the surface beneath.

Although this method is best suited to printing on flat surfaces, it is used for printing on the outside of objects in the form of circular cylinders, such as bottles and the like. The procedure is modified slightly in that the object is arranged to rotate as the screen moves over it, and the squeegee remains stationary.

It is not easy to modify the process for printing on surfaces which are not flat or of circular cross-section, and methods other than screen printing are commonly used. Similarly, printing on internal surfaces, such as the bore of a tube, is not possible by known screen printing methods. Printing on the internal surfaces of the bodies may be done for decorative effect where the body is translucent. In the case of opaque bodies it is sometimes necessary to form patterns of etch-resistant, conductive fluids on the internal surfaces. For example, in the former case it may be desirable to print a pattern on an article such as a lamp shade. An example of the latter case is the printing of an electrically conductive pattern on the inner surface of a ceramic tube for a particle accelerator vacuum chamber.

The object of the invention is to provide apparatus suitable for printing on external or internal cylindrical surfaces as hereinafter defined.

As used in this specification and claims the expression "cylindrical surface" means a surface traced out by a straight line which moved parallel to itself and describes with each of its ends a fixed smooth closed curve. This excludes cases where the fixed closed curves have sharp angles or corners in them, but includes both external and internal surfaces.

According to the present invention apparatus for printing a required pattern on a cylindrical surface of a body comprises a screen of substantially the same shape and dimensions as the cylindrical surface and which is impervious to a desired printing fluid except over an area

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or areas defining the pattern, means for supporting the screen in close proximity to that part of the surface on which the pattern is to be printed, and a squeegee movable in an axial direction over the screen on the side thereof remote from the surface and of such shape and dimensions that when the squeegee is moved in said axial direction the screen is pressed into contact with the surface.

The invention will now be described with reference to the accompanying drawings, in which:

FIGURES 1 and 2 show respectively plan and sectional side elevation view of apparatus for printing a pattern on the internal surface of an annular body; and

FIGURE 3 shows a sectional side elevation of apparatus for printing a pattern on the external surface of the same annular body.

In FIGURES 1 and 2, body 10 is of circular cross-section. A screen 11 of silk or some other suitable material is clamped to the rims of two wheel-shaped supports 12 and 13. Each support consists of a circular rim 7, a central boss 8 and three radial spokes 9, as shown. The two supports 12 and 13 are joined by three screws 14 passing through the spokes of the two frames. The two ends of the screws, and the part of the spokes through which they pass, are threaded in such a manner that the supports 12 and 13 may be moved apart by turning the screws 14 in one direction, and may be moved closer together by turning the screws in the opposite direction. Thus the tension of the screen 11 may be adjusted. The two supports 12 and 13 and the screen are of substantially the same cross-sectional dimensions as the body and are of such a shape that the screen may be supported very close to but not touching the internal surface of the body 10 on which the required pattern is to be printed.

A guide rod 15, capable of axial movement, passes through the central boss 8 of each of the supports 12 and 13, and carries a main squeegee in the form of a circular washer 16 clamped between two discs 17 by two nuts 18. The washer 16 is of flexible material and its dimensions are such that it presses the screen 11 outwards and into contact with the surface of the body as shown.

A secondary squeegee 19 is supported close to the main squeegee and is deflected upwards and away from the screen 11 by a deflector 20. The deflector is held in position by a spring 21 located between the upper disc 17 and the deflector. The deflector may be moved downwards against the action of the spring by a tube 22 coaxial with the guide rod 15. A peg 23 is fastened into the guide rod 15 and projects through a slot 24 in the tube 22, and the slot is shaped so that rotation of the tube relative to the guide rod causes the tube to move axially relative to the guide rod. As the deflector 20 is moved downwards, the secondary squeegee 19 moves towards the screen 11 and the main squeegee washer 16 is moved away from the screen. The secondary squeegee 19 is of slightly smaller diameter than the main squeegee washer 16, and does not press the screen 11 against the surface. The apparatus includes a jig (not shown) for locating the body 10 in the position shown.

The operation of the apparatus is described below.

A printing fluid is poured into the space between the screen 11 and the main squeegee washer 16, as shown at 25, and the squeegee is moved into its lowest position. The apparatus is then placed inside the bore in the body so that the screen 11 is close to the surface of the bore. The deflector is moved into the upper position such that the main squeegee washer 16 presses the screen 11 against the surface of the bore. The squeegee is then moved axially upwards by means of the guide rod 15, and printing fluid passes through the pattern

on the screen and on to the surface of the bore. At the end of the travel, the deflector 20 is moved downwards to disengage the main squeegee. The squeegee is then moved downwards, and the secondary squeegee skims the surface of the screen and carries the remaining printing fluid back to the initial starting position.

FIGURE 3 shows a sectional side elevation of apparatus for printing on the external surface of the same body. The apparatus is basically the same, and the same references have been used on the drawings. The difference between the two embodiments is that in that of FIGURE 3, the screen 11, supports 12 and 13, and the squeegees are arranged outside the body as shown. The guide rod 15 and coaxial tube 22 shown in FIGURES 1 and 2 are replaced by other means located outside the body. As before, a jig locates the body inside the apparatus in the position shown. The operation of the apparatus of this embodiment is very similar to that already described above. As before, the screen is of substantially the same cross-sectional dimensions as the body.

It will be necessary to use different apparatus for each variation in the size or shape of the bore. As stated in the introduction, the apparatus may be used for a wide variety of shapes, and the supports 12 and 13, screen 11 and squeegees must be of substantially the same shape.

Many variations common to know screen printing methods may be applied to the apparatus described above. For example, the thickness of the deposited layer of printing fluid depends, amongst other factors, on the diameter of the threads making up the screen. Hence the layer thickness may be changed by using a screen made of fibres made of a different thickness.

Similarly, materials other than silk may be used for the screen.

What I claim is:

1. Apparatus for printing a required pattern on a cylindrical surface of a body, comprising a cylindrical screen of substantially the same shape and cross-sectional dimensions as the cylindrical surface and which is impervious to a desired printing fluid except over an area or areas defining the pattern, means for supporting the screen in close proximity to that part of the surface on which the pattern is to be printed, and a main squeegee movable in an axial direction over the screen on the side thereof remote from the surface and being of such shape and dimensions that when the main squeegee is moved in said axial direction the screen is pressed into contact with said surface.

2. Apparatus as claimed in claim 1 which includes deflector means operable to deflect the main squeegee away from said surface.

3. Apparatus as claimed in claim 2 which includes a secondary squeegee the position of which is controlled by the deflector means such that the secondary squeegee is in light contact with the screen when the main squeegee is deflected away from the screen by the deflector means.

4. Apparatus as set forth in claim 1 in which the support means are arranged to support the screen in close proximity to an internal surface.

5. Apparatus as set forth in claim 4 including a secondary squeegee disposed in close proximity to the screen and movable in an axial direction along the screen on the side thereof remote from the surface, and reflecting means between said squeegees operable to deflect the main squeegee away from the screen while maintaining the secondary squeegee in light contact with the screen.

6. Apparatus for printing a required pattern on an internal cylindrical surface of a body comprising a cylindrical screen, said screen having a cross-sectional diameter smaller than the cross-sectional diameter of the

body, said screen being impervious to a desired printing fluid except over an area or areas defining the pattern and being yieldable in a radial direction, means for supporting the screen within said body, and in close proximity to the internal surface of the body, a main squeegee, a secondary squeegee, means for supporting said main squeegee and said secondary squeegee for movement in an axial direction along the internal surface of said screen, said main squeegee being of circular shape in cross-section and of such dimensions that when the main squeegee is moved axially in one direction the screen is caused to yield radially and be pressed into contact with the internal surface of the body at the area adjacent the periphery of the main squeegee, and deflecting means disposed between said main squeegee and said secondary squeegee, said deflecting means being operable for deflecting said main squeegee in a direction away from the screen to allow movement axially in the other direction.

7. Apparatus for printing a required pattern on an internal cylindrical surface of a body as set forth in claim 6 wherein said secondary squeegee is of circular shape and has a diameter smaller than that of said main squeegee, said secondary squeegee being operably connected to said deflecting means so as to be positioned in light contact with the internal surface of the screen when moved in said other axial direction.

8. Apparatus for printing a required pattern on an external cylindrical surface of a body comprising a cylindrical screen, said screen having a cross-section diameter greater than the cross-sectional diameter of the body on which the pattern is to be printed and being yieldable in a radial direction, said screen being impervious to a desired printing fluid except over an area or areas defining the pattern, means for supporting the screen in close proximity to the external surface of the body and in surrounding relationship therewith, a main squeegee, a secondary squeegee, means for supporting said squeegees for movement in an axial direction along the outer surface of said screen, said main squeegee being of circular shape in cross-section and including a bore having an internal diameter of such dimension that when the main squeegee is moved axially in one direction the screen is caused to yield radially inward and be pressed into contact with the external surface of the body, and deflecting means disposed between said main squeegee and said secondary squeegee being operable for deflecting said main squeegee in a direction away from said screen so as to allow movement of the main squeegee axially in the other direction.

9. Apparatus for printing a required pattern as set forth in claim 8 wherein said secondary squeegee is of circular shape and includes an internal bore having a diameter greater than that of said main squeegee, said secondary squeegee being operably connected to said deflecting means so as to be positioned in light contact with the external surface of the screen when moved in the other axial direction while said main squeegee is deflected away from the screen.

References Cited

UNITED STATES PATENTS

2,014,372	9/1935	Brickell	101—114
2,863,382	12/1958	Giani	101—123
3,263,603	7/1966	Fuchs	101—123
3,269,305	7/1966	Rossi	101—123 XR
3,055,339	9/1962	Pistole et al.	118—408

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